

**REMARKS**

Applicants respectfully request reconsideration of the Office Action of March 14, 2007.

Amendment of claim 4 is supported by page 8, 22 and 25. Applicants rely on the Table 1 on specification page 25 as support for the temperature range: the highest temperature of Example 4 is set for the upper limit and the lowest temperature of Examples 2 and 6 is set for the lowest limit of the range.

Applicants respectfully traverse the rejections of Claims 1-12 under 35 USC 102 over J. Macromol. Sci.-CHEM., A8 (7), p. 1205-1238 (1974) to Baucom and Butler [hereinafter "Baucom"]. Baucom does not disclose any polymers or any polymerization of the investigated monomers. In summary, Baucom, cited by the Examiner, fails the requirements of an anticipatory references as required by Section 2131 of the MPEP; Section 2131 requires that a reference which is applied as anticipatory of claims must independently provide (1) written description and (2) enablement of the claimed subject matter. Baucom does neither.

The "Experimental" section of Baucom does not relate to polymerizations; rather it relates to the production of *monomeric acrylates*. Thus the Baucom description does not describe polymers with a molecular weight of 1500 to 30000, as specified in the rejected claims. Moreover, Baucom does not describe conditions for polymerization. Thus, the Baucom reference satisfies neither of the two requirements of MPEP Section 2131.

Rather Baucom et al. (J. Macromol. Sci.-CHEM., A8(7), p. 1205-1238 (1974), relates to investigation(s) of various monomers by spectroscopic analysis. Further, the value  $k_c/k_p$  described in page 1206 of Baucom is irrelevant to the claims under examination, although the U.S. PTO relies upon its recitation in the outstanding Office Action. The ratio of rate constants of cyclization to propagation ( $k_c/k_p$ ) is a value for 1,6-heptadiene itself rather than those for general 1,6-diene-type compounds. Notably, according to applicants' representatives in Japan, characteristics of cyclization polymerization of 1,6-dienes are quite different from each other, due to difference in their structure. For example, allyl acrylamide and allyl methacrylamide have 1,6-diene

structure, however the degrees of cyclization of the resultant polymer, on polymerization, is as low as 26% and 37%, respectively, even when they are polymerized in the conditions of low concentration of the monomer which is advantageous to cyclization, polymerization (initiator: AIBN, at 60°C in a sealed tube, *Macromol. Chem.*, 189, 1835 (1998)). The polymer having such low degree of cyclization cannot be referred to as "cyclization polymerization product".

Applicants respectfully request withdrawal of that anticipation grounds of rejection.

Applicants' traverse the Section 103 rejection; in applicants' view, the Office Action suggests that [1] that the Examiner appears to be of the opinion that polymerization products of 1,6-dienes are obvious to the one skilled in the art, regardless of their structure; and [2] a new polymer derived from a newly synthesized 1,6-diene monomer is not novel. In applicants' opinion, positions 1] and 2] do not appear to be correct; and with respect to any issue of obviousness, it is noted that the cyclization polymerization characteristics of 1,6-dienes vary remarkably depending on their structures as described above.

Please see *Journal of Macromolecular Sciences*, Vol. A8, No. 7, p. 1239-1247 (1974), for polymerization studies. (This was cited in applicants' IDS of December 14, 2005, as reference A5). The cyclization polymerization characteristics of 2-phenylallyl ether (compound XXII),  $\alpha$ -allyloxy-methyl-styrene, and 2-phenylallyl methallyl ether (compound XXIV) are dissimilar and not totally predictable. In fact, compound XXIV does not provide any polymerization product in the conditions. This is evidence that the polymerization behavior of 1,6-dienes even having similar structure is difficult to predict; that is inconsistent with what applicant perceives the Examiner's opinion to be, and embodied by 1] above.

As for compound XXII, polymerized compound is obtained by utilizing the following conditions:

- (a) Temp.: 50°C, Initiator: AIBN (radical), Solvent: Benzene; Yield: 4.8%, Intrinsic viscosity ( $\eta$ ): 0.125dL/g; amount of residual unsaturation: merely qualitative as "very little"

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- (b) Temp.: -78°C, Initiator: BF<sub>3</sub> (Lewis acid), Solvent: CH<sub>2</sub>Cl<sub>2</sub> and CHCl<sub>3</sub>;  
Yield: not described, Intrinsic viscosity ( $\eta$ ): 0.07dL/g; amount of residual unsaturation: not described

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In A5, Butler tries to synthesize a polymer of high degree of cyclization by utilizing "solution polymerization" in which a solvent is used. It may be ordinary knowledge that the degree of cyclization will increase with increasing dilution of the monomer with the solvent (i.e. low concentration of the monomer.) As a result, in condition (a), a polymer of high degree of cyclization seems to be obtained, however the degree of cyclization is supported by a merely qualitative description "very little" for the amounts of residual unsaturation; and a concrete value of the degree of cyclization is unclear. In addition, the yield of the polymer is very low.

Further, in view of its intrinsic viscosity, the resultant polymer should have low molecular weight (although its concrete value is unclear), since it is obtained from polymerization under conditions of low monomer concentration. The ordinary knowledge in the art teaches that the molecular weight of the resultant polymer will decrease as the concentration of the monomer is lowered.

Still further, as a result of low molecular weight, the glass transition temperature should be low, since the ordinary knowledge in the art teaches that the glass transition temperature will increase as the molecular weight increases, up to molecular weight of 10,000.

In summary, the inventor believes that low polymerization temperature contributes low molecular weight and low glass transition temperature of the polymer derived from compound XXII.

By comparison, when a production process utilizes a bulk polymerization process, in which no solvents are used. In the bulk polymerization using AIBN as an initiator at 60°C, a little amount of low molecular weight polymer is obtained in low yield and low degree of cyclization. The inventor thinks that the resultant polymer obtained under this conditions would have higher molecular weight than the polymer of A5. Taking the

above result into account, the inventors found that heat-resistant polymers having higher molecular weight, higher degree of cyclization, and higher glass transition temperature can be obtained by bulk polymerization at higher temperature using cumene hydroperoxide as an initiator.

As described above, the conditions for cyclization polymerization of the present invention (cumene hydroperoxide as an initiator, absence of solvents and high reaction temperature) are totally different from those of A5 (AIBN or  $\text{BF}_3$  as an initiator, presence of solvents and low reaction temperature). Therefore, the resultant polymer of the present invention could have totally different properties from those of A5. Especially, when using a polymerization temperature of 140-180°C, cyclization polymerized product can be obtained in high yield according to the present invention, and the resultant polymers have high molecular weight, high degree of cyclization and high glass transition temperature; as shown in Examples of the present specification. Again, it should be emphasized that polymerization of the same monomer does not necessarily produce a polymer of high molecular weight, high degree of cyclization and high glass transition temperature, instead the properties are greatly affected by the reaction conditions.

Reconsideration and an early allowance are respectfully solicited.

Respectfully submitted,

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Marina V. Schneller  
Marina V. Schneller  
Registration No. 26,032  
VENABLE LLP  
P.O. Box 34385  
Washington, D.C. 20043-9998  
Telephone: (202) 344-4000  
Telefax: (202) 344-8300